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AMENDEMENTS TO THE SPECIFICATION

Please replace the paragraph beginning on page on page 1 line 31, and ending on page 2 line 6, by the following amended paragraph:

According to the above mentioned object, from a broad aspect of the invention, there is provided a method for estimating an optimal dosage of bleaching agent to be used in a process for producing pulp of a required brightness value from wood chips. The method comprises the step of: i) estimating a set of wood chip properties characterizing said wood chips to generate corresponding wood chip properties data, said set including reflectance-related properties and wood chip size; said method being characterized by further comprising the steps of: ii) providing an initial dosage value of said bleaching agent; and iii) feeding said wood chip properties data and said bleaching agent dosage value at corresponding inputs of a predictive model for generating predicted brightness value of pulp to produce from said wood chips, to estimate the optimal bleaching agent dosage for which said predicted brightness value substantially reaches said required brightness value, wherein the predictive model estimates the optimal bleaching agent dosage by performing the steps of: a) comparing the brightness predicted value with the required brightness value to generate error data; b) optimizing the bleaching agent dosage value to minimize the error data; and c) repeatedly generating predicted brightness value and performing said steps a) and b) with the optimized bleaching agent dosage value until the predicted brightness value substantially reaches the required brightness value, to estimate said optimal bleaching agent dosage.

Please, replace the paragraph beginning on page 2 line 7 and ending at line 14, by the following amended paragraph:

According to the same object, from another aspect of the invention, there is provided a method of controlling the bleaching of pulp in a pulp production process on the basis of the optimal bleaching agent dosage estimated according to the above mentioned estimation method, said pulp production process including, between said steps i) and iii), at least one processing step including a step of refining said wood chips to produce refined wood chips. The control method comprises the step of: ~~a)~~ d) adding bleaching agent to said refined wood chips according to said optimal bleaching agent dosage to produce said pulp.

Please, replace the paragraph beginning on page 2 line 15 and ending at line 27, by the following amended paragraph:

According to the same object, from another aspect of the invention, there is provided a method of controlling the bleaching of pulp in a pulp production process on the basis of the optimal bleaching agent dosage estimated according to the above mentioned estimation method, said pulp production process including, between said steps i) and iii), at least one processing steps including a step of refining said wood chips to produce refined wood chips. The control method comprising the step of: ~~a)~~ d) estimating a resulting brightness value of the pulp according to a time delay following said predicted brightness value generation; ~~b)~~ e) comparing said predicted brightness value with said resulting brightness value to generate further error data; ~~c)~~ f) further optimizing said bleaching agent dosage value to minimize said further error data; and ~~d)~~ g) adding bleaching agent to said refined wood chips according to said further optimized bleaching agent dosage to produce said pulp.

Please, replace the paragraph beginning on page 2, line 28, and ending on page 3 line 2, by the following amended paragraph:

According to the same object, from another aspect of the invention there is provided an apparatus for estimating an optimal dosage of bleaching agent to be used in a process for producing pulp of a required brightness value from wood chips. The apparatus comprises means for estimating a set of wood chip properties characterizing said wood chips to generate corresponding wood chip properties data, said set including reflectance-related properties and wood chip size. The apparatus is characterized by further comprising: data processor means implementing a predictive model receiving at corresponding inputs thereof said wood chip properties data and an initial bleaching agent dosage value for generating predicted brightness value of pulp to produce from said wood chips, to estimate the optimal bleaching agent dosage for which said predicted brightness value substantially reaches said required brightness value, wherein said predictive model includes means for comparing the brightness predicted value with the required brightness value to generate error data, and means for optimizing said bleaching agent dosage value to minimize said error data.

Please, replace the paragraph beginning on page 10 line 5, and ending on page 11 line 14, by the following amended paragraph:

A neural network-based predictive model that can be used to carry out the method according to the invention will now be described in reference to Fig. 4. It is to be understood that any appropriate modeling technique such as neural network, PLS, Model Predictive Controller (MPC), regression, state space matrix, FRI, fuzzy logic, genetic algorithm, or a combination thereof can be used to obtain a predictive model for the purpose of the present invention. Some of those known predictive modeling techniques are discussed by Quian, X. et al. in "Mechanistic Model for Predicting Pulp Properties from Refiner Operating Conditions" TAPPI Journal, 78 (4) (1994); by Qian, Y. et al. in "Fuzzy Logic Modeling and Optimization of a Wood Chip Refiner" TAPPI Journal, 77 (2) (1995), and by Qian, Y. et al. in "Modeling a Wood-Chip Refiner Using Artificial Neural Networks, TAPPI Journal, 78 (6): 167-174 (1995). The predictive model generally designated at 10 and as readily implemented in a data processing device such as a computer (not shown) provided on the bleaching agent dosage estimating apparatus and bleaching control system represented in Fig.4, preferably includes a neural network 12 that was previously trained according go to the experimentally obtained data on wood chip properties and on dosage of said bleaching agent as described above, i.e. over the nine (9) remaining database columns consisting of eight (8) inputs identified by PLS method as shown in Fig. 1, and one output, namely pulp brightness as shown in Fig. 3. Such known neural network and associated training approach are discussed by Laperrière L. et al. in "Modeling and simulation of pulp and paper quality characteristics using neural networks, Solutions " TAPPI Vol. 84, no. 10 (Oct. 2001). After a few unsuccessful training trials, it was noticed that the input NaOH is always a ratio of the input H2O2, so it was eliminated from the training set. Out of the available (506) training lines, a selected number (96) were removed (about 20%) and injected back to the trained network for validation. Different sets of the removed 20% were tested and gave similar results. The final configuration was a 7-5-1 neural network (7 inputs, 5 hidden neurons and 1 output) as designated at 12 in Fig. 4. Training was stopped after an average absolute mean error of 5% was reached between the neural network prediction and the training output brightness value for each of the 506 lines. The value of 5% was chosen by taking two factors into consideration: 1) reliability of the output measurements: the experimental error related to the brightness value is about 3%, i.e. ±0.5 brightness points in the experimental span of 43.79 to 80.2 measured brightness; and 2) reliability of the input measurements: calibration errors

may encourage an increase of the training error. The training results of the final network, in terms of the connection weights between each of its constituting neurons, were imported into the neural network 12 of model 10, in the form of a computer program that can be implemented in a microcomputer by any person skilled in the art using well-known programming tools. Such program is able to simulate brightness prediction based on the seven (7) chosen inputs, namely reflectance-related properties of wood chips that are Luminance, M, H, S, L and chip size from measurement system 14 as part of the bleaching agent dosage estimating apparatus, and bleaching agent dosage (peroxide charge) value used by the bleaching unit 16 as part of the bleaching control system, to add a corresponding volume of bleaching agent solution into the pulp made of refined wood chips to produce bleached pulp. Optionally, unmodeled disturbances may also be applied to the neural network at input 17.